

**CLAIMS:**

1. A machine having a machine interface to allow a user to select a machine operation, the machine interface comprising:

5           outputting means for outputting questions to the user;

          inputting means for receiving input answers to the questions; and

          processing means for determining a set of data from  
10       at least one said input answer and for using the set of data to execute a said machine operation and for determining a question for output by said outputting means, said processing means being adapted to store a set of data determined from at least one said input answer  
15       identified as a bookmark and to retrieve said set of data when the bookmark identifier is determined from a said input answer.

2. A machine according to claim 1, including keyword  
20       determining means for determining keywords using the input answer, wherein said set of data comprises at least one keyword and said bookmark identifier comprises said at least one keyword.

3. A machine according to claim 2, including score storage means for storing a score for each of a plurality of machine operations, the score indicating the likelihood that the user will select a corresponding machine operation keyword; storage means for storing said at least one keyword and scores for said at least one keyword for each machine operation, said scores indicating the likelihood that a user wishes to select a machine operation having caused a said keyword to be input; said processing means being adapted to use the determined input keywords and said keyword storage means to adjust said scores in said score storage means, to use the adjusted scores to identify said machine operation to be executed, and to adjust the scores for keywords stored in said keyword storage means using said at least one keyword of said bookmark identifier.

4. A machine according to claim 1, wherein said processing means is adapted to automatically determine said bookmark identifier using the response to an initial question when a said machine operation is selected to be executed.

5. A machine according to claim 1, wherein said inputting means is adapted to input a bookmark

instruction and a said bookmark identifier, said processing means being responsive to said bookmark instruction to store the current set of data determined from said at least one input answer identified by said bookmark identifier.

6. A machine according to claim 5, including keyword determining means for determining keywords using the input answers, wherein said set of data comprises at least one keyword.

7. A machine according to claim 6, including score storage means for storing a score of each of a plurality of machine operations, the score indicating the likelihood that the user will select a corresponding machine operation, keyword storage means for storing said at least one keyword and scores for said at least one keyword for each machine operation, said scores indicating the likelihood that a user wishes to select a machine operation having caused a said keyword to be input, said processing means being adapted to use the determined input keywords and said keyword storage means to adjust said scores in said score storage means, to use the adjusted scores to identify said machine operation to be executed, and to adjust the scores for keywords stored

in said keyword storage means using said current set of data identified by said bookmark identifier.

8. A machine according to claim 1 wherein said processing means is adapted to execute a said machine operation when said set of data uniquely identifies said machine operation.

9. A machine according to claim 1 wherein said processing means is adapted to determine said set of data from pieces of input information.

10. A machine according to claim 9 wherein said processing means is adapted to execute a said machine operation when said set of data is complete.

11. A machine according to claim 1 wherein said processing means is adapted to determine said set of data by looking up data associated with an output question using the input answer.

12. A machine according to claim 1 wherein said processing means is adapted to select a question for outputting by said outputting means in dependence upon previous answers received.

13. A machine according to claim 1 wherein said processing means is adapted to select a question for outputting by said outputting means from a list of questions.

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14. A method of providing a machine interface to allow a user to select a machine operation, the method comprising:

outputting questions to the user;

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receiving input answers to the questions;

determining a set of data from at least one said input answer;

using the set of data to execute a machine operation or determining and outputting a question to the user;

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wherein a set of data determined from at least one input answer identified as a bookmark is stored and said set of data is retrieved when the bookmark identifier is determined from a said input answer.

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15. A method according to claim 14 including determining keywords using the input answers, wherein said set of data comprises at least one keyword and said bookmark identifier comprises said at least one keyword.

16. A method according to claim 15 including providing a store with scores for a plurality of machine operations, each score indicating the likelihood that the user will select a corresponding machine operation; providing a store of said at least one keyword and scores for said at least one keyword for each machine operation, said scores indicating the likelihood that a user wishes to select a machine operation having caused a said keyword input; using the determined input keywords to look up scores stored for keywords to adjust said scores for each machine operation; using the adjusted scores to identify said machine operation to be executed; and adjusting the scores for stored keywords using said at least one keyword of said bookmark identifier.

17. A method according to claim 14 wherein said bookmark identifier is automatically determined using the response to an initial question when a said machine operation is selected to be executed.

18. A method according to claim 14 including inputting a bookmark instruction and a said bookmark identifier, wherein the current set of data determined from said at least one input answer identified by said bookmark

identifier is stored in response to the input of said bookmark instruction.

19. A method according to claim 18 including determining  
5 keywords using the input answers, wherein said set of data comprises at least one keyword.

20. A method according to claim 19 wherein a score for  
each of a plurality of machine operations is stored, the  
10 score indicating the likelihood that the user will select a corresponding machine operation; said at least one keyword and scores for said at least one keyword for each machine operation are stored, said scores indicating that the likelihood that the user wishes to select a machine  
15 operation having caused a said keyword to be input; the determined input keywords are used to look up keyword scores to be used to adjust said scores for said machine operations; the adjusted scores are used to identify said machine operation to be executed; and the stored scores  
20 for keywords are adjusted using said current set of data identified by said bookmark identifier.

21. A method according to claim 14 wherein a said  
machine operation is executed when said set of data  
25 uniquely identifies said machine operation.

22. A method according to claim 14 wherein said set of data is determined from pieces of input information.

23. A method according to claim 22 wherein a said machine operation is executed when said set of data is complete.

24. A method according to claim 14 wherein said set of data is determined by looking up data associated with an output question using the input answer.

25. A method according to claim 14 wherein a question is selected for outputting in dependence upon previous answers received.

26. A method according to claim 14 wherein a question is selected for outputting from a list of questions.

27. A program code for controlling a processor to implement the method of claim 14.

28. A carrier medium carrying the program code according to claim 27.



29. A machine having a machine interface to allow a user to select a machine operation, the machine interface comprising:

question storage means for storing a plurality of questions for output to the user;

score storage means for storing a score for each of a plurality of machine operations, said score indicating the likelihood that the user will select a corresponding machine operation;

question selection means for selecting a next question for output to the user from said question storage means by determining, for each of a plurality of said questions, an average of the least number of questions required to be answered by the user to arrive at each said machine operation weighted by the respective scores, and selecting a question having the lowest average number;

outputting means for outputting the selected question to the user;

inputting means for receiving an input answer to the question from the user; and

processing means for responding to the input answer by carrying out a said machine operation and/or by adjusting the scores for each of the plurality of machine operations stored in said operation storage means;

said question selection means being adapted to carry out at least one further selection of a said next question using the adjusted scores stored in said operation storage means for output by said outputting means.

30. A machine according to claim 29 wherein said question storage means is adapted to store, for a specified answer, for each of a plurality of said questions, an identifier for a corresponding machine operation to be carried out in response to input of said specified answer, and said processing means is responsive to a said specified answer to a said question to carry out the machine operation identified by a corresponding said identifier for the specified answer.

31. A machine according to claim 29 wherein said processing means is responsive to the input answer to carry out a said machine operation having the most significant score stored in said operation storage means.

32. A machine according to claim 29 wherein said question storage means is adapted to store expected answers to said questions from the user, and said question selection means is adapted to determine said

least number of questions by predicting the expected answers input by the user to select each of said machine operations.

5 33. A machine according to claim 29 including word storage means for storing keywords for each of said plurality of machine operations; and keyword determining means for determining keywords using said input answer; wherein said processing means is adapted to match the  
10 determined keywords to the keywords stored in said word storage means, and to adjust the scores for each of the plurality of machine operations in dependence upon the matching.

15 34. A machine according to claim 33 wherein said word storage means is adapted to store scores for the keywords for each of said plurality of machine operations, and said processing means is adapted to determine scores for determined keywords for each of said plurality of machine  
20 operations by matching the determined keywords to the keywords stored in said word storage means, and to adjust the scores for each of said plurality of machine operations using the determined scores for keywords.

35. A machine according to claim 33 wherein said question storage means is adapted to store keywords associated with expected answers to at least some of the questions, and said keyword determining means is adapted to determine keywords from the association with an input answer using said question storage means.

36. A machine according to claim 29 wherein said question selection means is adapted to use a recursive process for the determining process to identify sequences of questions to select each said machine operation.

37. A machine according to claim 36 wherein said question selection means is adapted to carry out the recursive process for each sequence until the sequence length reaches a threshold length.

38. A machine according to claim 29 wherein said question selection means is adapted to perform the determining for each of a plurality of questions, by determining an average of the least number of questions required to be answered to arrive at only the machine operations having the highest scores weighted by the respective scores.

39. A machine according to claim 29 wherein said question selection means is adapted to perform the determining only for questions the answers to which can cause the score of a most likely machine operation to increase.

40. A machine according to claim 29 wherein said question selection means is adapted to select a plurality of said questions for use as the plurality of questions in the determining process by selecting a plurality of questions assigned the highest score, and to determine scores for the questions by using at least one of three techniques, namely;

I. taking the score of the machine instruction having the highest score after asking the question and predicting an answer;

II assigning a high score to questions relating to the same topic as a previous input answer, and

III assigning a high score to questions relating to the same topic as any previous answers.

41. A machine according to claim 40 wherein said question selection means is adapted to determine scores for the questions by using all three techniques and taking a weighted average of the determined scores.

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42. A machine according to claim 29 wherein said score storage means is adapted to store scores for hierarchical classifications of said machine operations, each hierarchical classification comprising a topic to which the machine operations in the hierarchy below relate and having a score comprising the sum of the scores for the machine operations in the hierarchy below, the machine interface including uncertainty means for indicating uncertainty to a user if the score for any of the hierarchical classifications at predetermined level of hierarchical classification is below a threshold.

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43. A machine according to claim 29 including means for uniformly decaying the scores for each said machine operation stored in said score storage means by a predetermined amount after a question has been answered.

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44. A machine according to claim 29 including means to allow questions to be entered into or adjusted in said question storage means.

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45. A machine according to claim 29 including means to allow scores to be entered into or adjusted in said score storage means.

5 46. A machine according to claim 33 including means to allow words to be entered into or adjusted in said word storage means.

10 47. A machine according to claim 29 wherein said outputting means is adapted to generate speech and said inputting means is adapted to recognise speech.

15 48. A method of providing a machine interface to allow a user to select a machine operation, the method comprising:

providing a stored plurality of questions for output to the user;

20 providing a stored score for each of a plurality of machine operations, each score indicating the likelihood that the user will select a corresponding machine operation;

25 selecting a next question for output to the user from the stored questions by determining, for each of a plurality of said questions, an average of the least number of questions required to be answered by the user

to arrive at each said machine operation weighted by the respective scores, and selecting a question having the lowest average number;

outputting the selected question to the user;

5 receiving an input answer from the user; and

responding to the input answer by carrying out a said machine operation and/or by adjusting the stored scores for each of the plurality of machine operations; and

10 repeating the selecting step using the adjusted scores and subsequently repeating the outputting, receiving and responding steps.

49. A method according to claim 48, wherein for a specified answer, for each of a plurality of said questions, an identifier for a corresponding machine operation to be carried out in response to input of said specified answer is stored, and in response to said specified answer being received from the user to a said question, the machine operation identified by a corresponding said identifier for a specified answer is executed.

50. A method according to claim 48 wherein a said machine operation having a stored score which is of a



threshold significance is executed in response to the input answer.

5 51. A method according to claim 48 wherein expected answers to said questions from the user are stored with the questions, and in said selecting step, the least number of questions is determined by predicting the expected answers input by the user to select each of said machine operations.

10 52. A method according to claim 48 including providing stored keywords for each of said plurality of machine operations, and determining keywords using said input answer, wherein the input answers are responded to by matching the determined keywords to the stored keywords and adjusting the scores for each of the plurality of machine operations in dependence upon the matching step.

20 53. A method according to claim 52, wherein scores for the keywords for each of said plurality of machine operations is stored, scores for determined keywords for each of said plurality of machine operations are determined by matching the determined keywords to the stored keywords, and the scores for each of said

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plurality of machine operations are adjusted using the determined scores for keywords.

54. A method according to claim 52 wherein keywords  
5 associated with expected answers to at least some of the questions are stored, and the step of determining keywords comprises determining keywords from the association of stored keywords with an input answer.

10 55. A method according to claim 48 wherein the selecting step comprises a recursive process to identify sequences of questions to select each said machine operation.

15 56. A method according to claim 55, wherein the selecting step carries out the recursive process for each sequence until the sequence length reaches a threshold length.

20 57. A method according to claim 48 wherein in the selecting step the determination for each of a plurality of questions is carried out by determining an average of the least number of questions required to be answered to arrive at only the machine operations having the highest scores weighted by the respective scores.

58. A method according to claim 48 wherein the selecting step performs the determination only for questions the answer to which can cause the score for a most likely machine operation to increase.

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59. A method according to claim 48 wherein said selection step selects a plurality of said questions for use as the plurality of questions in the determination by selecting a plurality of questions assigned the highest score, and determines scores for the questions by using at least one of three techniques, namely:

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(i) taking the score of the machine instruction having the highest score after asking the questions and predicting an answer,

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(ii) assigning a high score to questions relating to the same topic as a previous input answer, and

(iii) assigning a high score to questions relating to the same topic as any previous input answers.

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60. A method according to claim 59, wherein said selecting step determines scores for the questions by using all three techniques and taking a weighted average of the determined scores.

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61. A method according to claim 48 wherein scores for hierarchical classifications of said machine operations are stored, each hierarchical classification comprising a topic to which the machine operations in the hierarchy below relate and having a score comprising the sum of the scores for the machine operations in the hierarchy below; the method including indicating uncertainty to a user if the score for any of the hierarchical classifications at a predetermined level of hierarchical classification is below a threshold.

62. A method according to claim 48 including uniformly decaying the scored scores for each said machine operation by a predetermined amount after a question has been answered.

63. A method according to claim 48 including receiving and storing new questions, or receiving instructions to adjust stored questions.

64. A method according to claim 48 including receiving and storing new scores for new machine operations, or instructions to adjust stored scores for current machine operations.

65. A method according to claim 52 including receiving and storing new keywords or receiving instructions to adjust stored keywords.

5 66. A method according to claim 48 wherein the outputting step includes the generation of speech and the inputting step includes the recognition of speech.

10 67. Program code for controlling a processor to carry out the method of claim 48.

68. A carrier medium carrying the program code according to claim 67.

15 69. A machine having a machine interface to allow a user to select a machine operation, the machine interface comprising:

20 score storage means for storing a score for each of a plurality of machine operations, said score indicating the likelihood that the user will select a corresponding machine operation;

25 question selection means for selecting a next question for output to the user from a question storage means by determining, for each of a plurality of said questions, an average of the least number of questions

required to be answered by the user to arrive at each said machine operation weighted by the respective scores, and selecting a question having the lowest average number;

5           outputting means for outputting the selected question to the user;

          inputting means for receiving an input answer to the question from the user; and

10           processing means for responding to the input answer by carrying out a said machine operation and/or by adjusting the scores for each of the plurality of machine operations stored in said operation storage means;

15           said question selection means being adapted to carry out at least one further selection of a said next question using the adjusted scores stored in said operation storage means for output by said outputting means; and

20           said processing means further being adapted to store a set of data determined from at least one said input answer identified as a bookmark and to retrieve said set of data when the bookmark identifier is determined from a said input answer.

70. A method of providing a machine interface to allow a user to select a machine operation, the method comprising:

5 providing a stored score for each of a plurality of machine operations, each score indicating the likelihood that the user will select a corresponding machine operation;

10 selecting a next question for output to the user from a plurality of stored questions by determining, for each of a plurality of said questions, an average of the least number of questions required to be answered by the user to arrive at each said machine operation weighted by the respective scores, and selecting a question having the lowest average number;

15 outputting the selected question to the user;

receiving an input answer from the user; and

20 responding to the input answer by carrying out a said machine operation and/or by adjusting the stored scores for each of the plurality of machine operations; and

25 repeating the selecting step using the adjusted scores and subsequently repeating the outputting, receiving and responding steps, which method further comprises identifying whether an input answer corresponds to a stored bookmark and when the input answer is

